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Environmental Assessment

Lime Creek Fish Barrier Special Use Permit

Cave Creek Ranger District, Tonto National Forest Maricopa and Yavapai Counties, Arizona

T.8N. R.6E. Secs.31-32



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Table of Contents

1.0 – Summary	1
2.0 – Introduction	2
2.1 – Document Structure	
2.2 – Background	3
2.3 – Purpose and Need for Action	
2.4 – Proposed Action	
2.5 – Decision Framework	
2.6 – Public Involvement	
2.7 – Issues	6
3.0 – Alternatives, including the Proposed Action	7
3.1 - Alternatives Considered but Eliminated from Detailed Analysis	
3.2 – Alternatives Considered In Detail	8
3.3 – Mitigation Measures	13
3.4 – Comparison of Alternatives	15
4.0 – Environmental Consequences	16
4.1 – Land Use and Recreational Impacts	
4.2 – Geology and Soils	17
4.3 – Biological Resources	
4.4 – Water Resources	
4.5 – Cultural Resources	
4.6 – Visual Resources	
4.8 – Cumulative Impacts	29
5.0 – Consultation and Coordination	
5.1 – ID Team Members	30
5.2 - Federal, State, and Local Agencies	
5.3 – Tribes	
5.4 – Others	30
6.0 – Literature Cited	31

1.0 - SUMMARY

The Cave Creek District of the Tonto National Forest is proposing to issue Salt River Project (SRP) a special-use permit (SUP) allowing SRP to construct and maintain a concrete fish barrier in Lime Creek, a tributary to the Verde River, as is consistent with the Tonto National Forest Land Management Plan (1985, as amended). The project is located on Lime Creek about two miles west of Horseshoe Reservoir and is within the Cave Creek Ranger District, Tonto National Forest, Arizona.

The proposed Lime Creek fish barrier is an obligation of an Incidental Take Permit (ITP) issued on May 30, 2008, to SRP by the U.S. Fish and Wildlife Service (USFWS) under Section 10(a)(1)(B) of the Endangered Species Act for continued operation of Horseshoe and Bartlett Reservoirs. The ITP and the accompanying Horseshoe and Bartlett Reservoirs Habitat Conservation Plan (HCP) identified the mitigation measures SRP will implement to minimize the impacts to threatened and endangered species and other sensitive riparian and aquatic species in the Verde River watershed. To protect a population of native fish and frogs from nonnative fish that could move from Horseshoe Reservoir into sensitive aquatic habitat in Lime Creek, the HCP mitigation measures included the construction and maintenance of a fish barrier for the term (50 years) of the ITP. A Record of Decision for the Environmental Impact Statement documenting the USFWS decision to issue the ITP, which included the fish barrier as a mitigation measure, became effective on June 13, 2008. This Environmental Assessment addresses the environmental impacts of constructing and maintaining the fish barrier and the proposed issuance of a SUP by the U.S. Forest Service (USFS) to SRP.

The potential effects of the proposed action on the environment include temporary construction and maintenance disturbance and long-term impacts due to the presence of the barrier. The effects of the proposed action would have minor impacts on land use and recreation, scenic, geology and soils, riparian vegetation, and terrestrial species. The barrier would cause minor impacts on water resource (downstream surface water rights) but the impacts would be fully mitigated. Cultural resources would be avoided and not impacted during construction and maintenance activities. Short-term impacts to aquatic species at the barrier site due to construction would be avoided. Over the long-term, the barrier would provide significant conservation benefits to sensitive aquatic species (Gila topminnow, longfin dace, lowland leopard frog) (USFWS 2008b).

In addition to the proposed action, the Forest Service also analyzed the following alternative:

• No Action Alternative: A fish barrier would not be constructed and the USFS would not issue a Special Use Permit to SRP to construct and maintain a fish barrier in Lime Creek. No short-term construction impacts or intermittent maintenance impacts would occur to the environment. The native aquatic species and the federally endangered Gila topminnow would remain threatened by upstream movements of non-native fish from Horseshoe Reservoir. SRP would work with the USFWS to develop an alternate mitigation project to meet their obligations under the HCP and ITP (USFWS 2008b).

The Forest Service also considered the following alternatives but found that they did not meet the purpose and need of the project and were not analyzed in detail:

- Fish barrier construction using rock gabions.
- Alternate barrier sites in Lime Creek.
- Increased monitoring for nonnative fish and future barrier construction and chemical renovation of the stream.

The Tonto National Forest Supervisor is the responsible official for this project and will decide whether to issue SRP a SUP as described in the proposed action, or to continue with current management.

Implementation of Lime Creek Fish Barrier SUP would immediately follow the decision and close of the appeal period.

2.0 - INTRODUCTION

2.1 – Document Structure

The Forest Service has prepared this Environmental Assessment in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This Environmental Assessment discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into four parts:

- *Introduction:* The section includes information on the history of the project proposal, the purpose of and need for the project, and the agency's proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.
- Comparison of Alternatives, including the Proposed Action: This section provides a more detailed description of the agency's proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on significant issues raised by the public and other agencies. This discussion also includes possible mitigation measures. Finally, this section provides a summary table of the environmental consequences associated with each alternative.
- Environmental Consequences: This section describes the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by resource area. Within each section, the affected environment is described first, followed by the effects of the No Action Alternative that provides a baseline for evaluation and comparison of the other alternatives that follow.
- Agencies and Persons Consulted: This section provides a list of preparers and agencies consulted during the development of the environmental assessment.

Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at the Cave Creek Ranger District Office in Tonto National Forest.

2.2 – Background _____

Native Arizona fishes are among the most endangered groups of species in the United States. In Arizona, 20 of 35 native fish species are federally listed as endangered or threatened. The decline of these fish species is partly the result of predation and competition with nonnative fish species (Pacey and Marsh 1998). Similarly, native ranid frog populations have also been impacted by nonnative fish. To conserve, manage, and recover these sensitive native fish and frog populations wildlife and land managers have often utilized fish barriers to isolate and protect the species from downstream populations of nonnative fish.

The proposed construction of a fish barrier in Lime Creek is an obligation of an ITP issued on May 30, 2008, to SRP by the USFWS under Section 10(a)(1)(B) of the Endangered Species Act in connection with the continued operation of Horseshoe and Bartlett Reservoirs. The ITP and the accompanying Horseshoe and Bartlett Reservoirs Habitat Conservation Plan (HCP) identified the mitigation measures that SRP will implement to minimize the impacts to threatened and endangered species and other sensitive riparian and aquatic species in the Verde River watershed (USFWS 2008a). To protect a population of native fish and frogs from nonnative fish that could move from Horseshoe Reservoir into sensitive aquatic habitat in Lime Creek, the HCP included the construction and maintenance of a fish barrier for the term (50 years) of the ITP. A Record of Decision for the Environmental Impact Statement documenting the USFWS decision to issue the ITP, which included the fish barrier as a mitigation measure, became effective on June 13, 2008.

Lime Creek supports a population of Gila topminnow (federally endangered native fish), longfin dace (a native fish), and lowland leopard frog (a native frog). Through a number of field visits, SRP, Arizona Game and Fish Department (AGFD) and Tonto National Forest staff identified the barrier site, which is located approximately 2 miles west and upstream of Horseshoe Reservoir. The barrier, if constructed, would isolate and protect approximately 4 miles of sensitive stream habitat for native aquatic species.

SRP contracted the Bureau of Reclamation's Phoenix Area Office (USBR) to design the fish barrier. USBR began a fish barrier program in Arizona in the late 1990's and has extensive experience with design, construction, and permitting of fish barriers in remote sites similar to Lime Creek. USBR engineers developed the construction documents and conducted an impact analysis on the environment and natural resources (USBR 2009). The results of the report are summarized throughout this Environmental Assessment. The detailed report (USBR 2009) is incorporated by reference, and is available for review at the Cave Creek Ranger District.

2.3 - Purpose and Need for Action

The purpose of this action is to authorize SRP through a Special Use Permit (SUP) to construct and maintain a fish barrier in Lime Creek. This action implements mitigation obligations for SRP's Horseshoe-Bartlett HCP. This action is needed because native fish and frog populations in Lime Creek are threatened by nonnative fishes moving upstream from the Verde River and Horseshoe Reservoir. There are currently no known nonnative fishes present in Lime Creek above the proposed barrier site; however, nonnative fish (i.e., green sunfish, goldfish) have been documented downstream of the proposed barrier site.

2.3.1 – Consistency with the Goals and Objectives of the Tonto National Forest Plan

This action responds to the goals and objectives outlined in the Tonto National Forest Plan, and helps move the project area towards desired conditions described in that plan (USDA 1985).

The Tonto National Forest Plan (USFS 1985) calls for general forest wide management prescriptions. Among these prescriptions are:

- Locate and survey all potential Gila topminnow sites. Where feasible, stock sites, monitor for success, and restock if necessary.
- Identify, survey, map, and analyze habitat for all federally listed species. Identify management conflicts and enhancement opportunities. Correct any management conflicts or problems.
- Habitat requirements for endangered species will take precedence over those for threatened species. Habitat requirements for threatened, endangered, and sensitive species will take precedence over requirements for other species and habitat requirements for sensitive species will take precedence over those for nonsensitive species.
- Manage the warm water non-game type streams to support Gila sucker and longfin dace.
- Using Desired Future Condition as a guide, optimize wildlife outputs in all management units by coordination of other resource activities and habitat improvement projects directly benefiting species covered by the Forest Plan.

The project is proposed within Management Area 1F (Cave Creek Ranger District General Management Area). The management emphasis for the area provides goals to, "[m]anage for a variety of renewable natural resources with primary emphasis on wildlife habitat improvement, livestock forage production, and dispersed recreation (USDA 1985)." Further, "[w]atersheds will be managed so as to improve them to a satisfactory or better condition." (USDA 1985) The Management Area goals also call for improvement and management of "the included riparian areas (as defined by FSM 2526) to benefit riparian dependent resources."(USDA 1985).

The proposed barrier is consistent with furthering the goals of the Tonto National Forest Plan because it provides for habitat improvements that will directly benefit two species (Gila topminnow and longfin dace) covered by the Forest Plan.

2.4 – Proposed Action _____

The action proposed by the Forest Service will result in issuance of a SUP to SRP to meet a mitigation obligation under an ESA Section 10 Permit. The SUP would authorize the construction, monitoring, and maintenance of a concrete fish barrier in Lime Creek by SRP.

The proposed location of the fish barrier is about 2 miles upstream of Horseshoe Reservoir in Lime Creek (Figure 1). The site of the barrier is at T.8N. R.6E. Secs.31-32. Lime Creek is a small stream with perennial flow in the upper portions (upstream of the proposed barrier site) and intermittent flow in the lower reaches (near the reservoir). A fish barrier at this location would protect 4+ miles of native fish and frog habitat, including existing populations of Gila topminnow, longfin dace, and lowland leopard frog.

The proposed fish barrier would be constructed in an area of exposed bedrock at a height that provides for a 4 foot drop on the downstream side. The barrier would be anchored into the existing bedrock and constructed of concrete and reinforcing steel bars. The barrier would be monitored and maintained by SRP.

In the event that the Forest Service determines the existence of the structure is not necessary, SRP would remove the barrier and rehabilitate the site. The necessary environmental compliance to address impacts of that action would be completed at that time and are not addressed in this document.

2.4.1 - Action Area/Area of Affected Environment

The area of affected environment is the area that would be directly or indirectly affected by the proposed federal action and not merely the immediate area involved in the action. The area affected by the USFS issuance of a SUP to SRP to construct and maintain a fish barrier in Lime Creek includes: the barrier construction site; upstream and downstream of the site where work would occur and sediment would be disturbed and/or deposited; the staging areas used during construction; the helicopter flight path used to transport equipment and materials from the SRP Horseshoe Dam field house to the barrier site; and an existing access road (FS 1530).

2.5 – Decision Framework _____

Given the purpose and need, the Tonto National Forest Supervisor of the Tonto National Forest will review the preferred alternative (proposed action) and the no action alternative, and will decide whether to implement the preferred alternative or the no action alternative, or whether to require further analysis in an environmental impact statement. The decision may also include mitigation measures to be applied to any selected alternative. If the analysis demonstrates that there are no significant impacts, the

Forest Supervisor would record the decision in a Decision Notice and Finding of No Significant Impact.

2.6 - Public Involvement

The proposal was listed in the Schedule of Proposed Actions on July 1, 2009. The proposal was provided to the public and other agencies for comment during scoping on May 18, 2009. In addition, as part of the public involvement process, the proposed barrier was identified as a mitigation measure to meet Endangered Species Act compliance for the operation of Horseshoe and Bartlett Dams by SRP. The July 2007 Federal Register notice of availability of the U.S. Fish and Wildlife Service's draft H-BHCP Environmental Impact Statement (72 FR 40892) provided the public with an initial opportunity to comment on the proposed barrier as well as other mitigation measures described in the document. The USFS and SRP have also coordinated with the Arizona Game and Fish Department (AGFD), USFWS, and USBR during site evaluations for barrier placement, and discussed the proposal with members of the statewide Native Fish Conservation Team (i.e., resource agencies, university researchers, non-governmental organizations, environmental organizations, and members of the public).

Using the comments from the public, other agencies, and environmental organizations (see *Issues* section), the interdisciplinary team developed a list of issues to address.

2.7 - Issues _____

The Forest Service separated the issues into two groups: significant and non-significant issues. Significant issues were defined as those directly or indirectly caused by implementing the proposed action. Non-significant issues were identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence. [The Council on Environmental Quality (CEQ) NEPA regulations require this delineation in 40 C.F.R. § 1501.7. Under this section, an acting agency must "...identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)..."]. A list of non-significant issues and reasons regarding their categorization as non-significant may be found at the Cave Creek Ranger District in the project record.

Four public comment letters were received during the scoping period and no significant issues were identified for this project. However, the interdisciplinary team identified several issues that could affect the environment and/or USFS resources. These issues include:

Land Use and Recreation: There was concern that improving FS1530 would allow increased motorized public access to Lime Creek, which could impact the environment within the Greater Lime Creek Inventoried Roadless Area. To avoid potential impacts, measures are proposed to transport construction and maintenance materials by helicopter, and limit road repairs to minimal improvements using hand tools.

Aquatic Species: There was concern that construction activities could cause impacts to species in the immediate vicinity of the barrier site. To avoid and minimize those impacts, conservation measures are proposed to capture and relocate aquatic species upstream from the site prior to construction or maintenance actions.

Threatened or Endangered Species: There was concern that Arizona cliffrose, an endangered plant, known to occur along FS1530 could be impacted during construction and maintenance. Measures are proposed to avoid possible impacts.

Cultural Impacts: The area surrounding Lime Creek and FS1530 are known to contain important cultural sites, and there was concern that construction activities could impact these resources. A cultural survey was completed in October 2009, and sensitive cultural areas were identified and will be avoided during construction and maintenance.

Water Resources: There was concern that ponding and subsequent evapotranspiration caused by the barrier would reduce stream flows and impact downstream surface water rights. Mitigation is proposed to offset possible impacts.

3.0 – ALTERNATIVES, INCLUDING THE PROPOSED ACTION

This chapter describes and compares the alternatives considered for the Lime Creek Fish Barrier Special Use Permit issuance. It includes a description each alternative considered. This section also presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public.

3.1 – Alternatives Considered but Eliminated from Detailed Analysis _____

In addition to the current proposed alternatives the following alternatives were considered but rejected:

- Alternative barrier construction: Fish barriers may also be constructed out of gabions. Gabions are a mesh wire boxes that are filled with rock and sand to act as a dam. This method of construction was eliminated from consideration based on the shorter lifespan of the barrier compared to concrete, the need for more frequent repairs compared to concrete, and because the rock structure is often too porous to prevent fish passage (Carpenter and Terrell 2005). Because this method of construction would not fulfill the purpose and need of the project, which is to provide long-term protection for native species, this alternative was eliminated from detailed consideration.
- Alternate barrier sites in Lime Creek: Other locations in Lime Creek were considered as barrier sites. These locations were eliminated from detailed consideration because they would require an increase in barrier size, involve much greater construction impacts, and provide no additional conservation

benefits (i.e., no increase in the amount of perennial stream habitat protected) compared to the proposed location.

• Existing Debris Barrier/Increased Monitoring: This alternative is similar to the No Action Alternative with a stepped up monitoring schedule. The area would be monitored frequently to determine when the existing debris barrier, comprised primarily of large woody debris and other vegetative material, held in place by boulders in a narrow portion of the stream channel is compromised. At that time a replacement barrier would be constructed and the stream would likely undergo chemical renovation treatments. The alternative was eliminated from future consideration because of the likelihood of failure of the debris barrier.

3.2 - Alternatives Considered In Detail

3.2.1 - Alternative 1: No Action

Under the No Action alternative, current management plans would continue to guide management of the project area. No SUP would be issued to SRP, and SRP would not construct a barrier to accomplish project goals. The existing resource conditions for native species would not be moved closer to the desired conditions as outlined in the Tonto National Forest Plan due to existence of nonnative aquatic species within the Verde River and Horseshoe Reservoir. Possible movement of non-native species upstream into Lime Creek could be detrimental to the continued existence of native aquatic species that currently exist upstream of the proposed barrier location.

Approximately 150 ft upstream of the proposed barrier site, an existing 3-ft natural debris barrier composed of boulders and sand/rock filled gaps likely impedes upstream movement of fish at low to medium flows. Over time, this barrier is not expected to prevent upstream movement of nonnative fish because of its low height and the high potential for flood flows to destroy or displace the boulders and smaller materials.

3.2.2 - Alternative 2: The Proposed Action

The action proposed by the Forest Service to meet the purpose and need is to authorize the construction and maintenance of a concrete fish barrier through the issuance of a SUP to SRP.

3.2.2.1 - Site Selection

Potential barrier sites were assessed through multiple on-the-ground site visits involving representatives from AGFD, USFWS, SRP, USFS, USBR, and Arizona State University. Included in these visits were fish biologists, ecologists, and engineers experienced in fish barrier design and placement. During these trips several possible barrier locations were identified. In subsequent discussions, the proposed barrier site emerged as the preferred location, because of the narrow channel and the exposed bedrock that minimizes construction impacts and minimizes the barrier size, and because of the limited fish habitat (dry or intermittent flow) downstream of the site (see Figure 1).

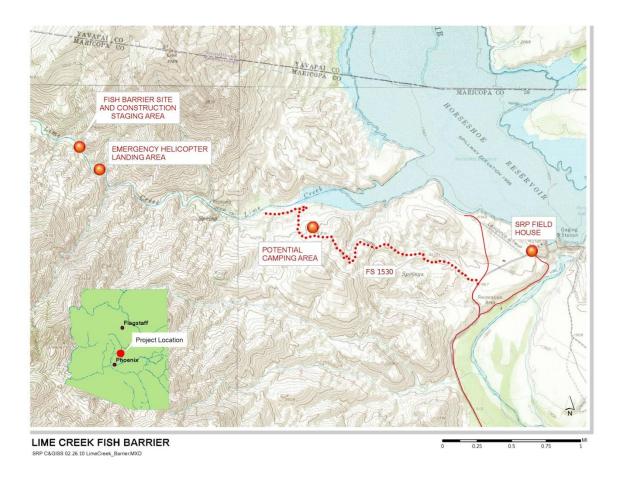


Figure 1. Lime Creek drainage with proposed barrier site.

The proposed site is located at the lower end of a 500-ft long exposed bedrock stream channel (Figure 2). The bedrock consists of granite porphyry and would be used as the base and abutments for the proposed barrier. This bedrock would allow for secure anchoring of the structure and eliminate channel migration that could compromise the barrier. The stream channel at the site is narrow, with a width of 5 ft at the water surface/base and widening to about 22 ft at 4 ft above ground. An existing bedrock chute provides a high velocity section below the proposed fish barrier site, which improves its effectiveness to prevent upstream movement of nonnative fish.

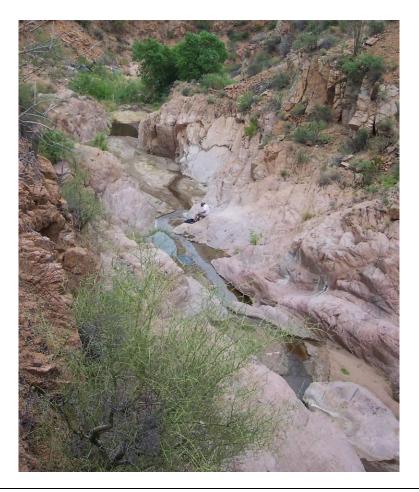


Figure 2. Exposed bedrock stream channel, with proposed barrier site location near person pictured.

3.2.2.2 – Barrier Design

The barrier would be comprised of reinforced concrete (approximately 5 cubic yards) anchored into the existing bedrock. It is designed to accommodate low and high flows, including a 100-year frequency flood of 14,900 cfs. The concrete would be colored to match the existing bedrock thereby minimizing the visual impact of the barrier. To inhibit crayfish movement no texture would be applied to the downstream face of the barrier. To date no crayfish have been detected above the proposed barrier location.

The barrier would be approximately 5 ft wide at the base and widening to about 22 ft at its top. The barrier would be constructed at a height which provides for a 4 ft drop on the downstream side. The top of the barrier would include a low flow notch. The low flow notch would be large enough to accommodate the normal daily flows of Lime Creek. The barrier would be attached to the bedrock with anchor bars that are molded into the concrete and grouted into holes drilled in the bedrock. To properly accommodate the barrier's anchors, approximately 42 linear feet of holes would be drilled in the bedrock. Additionally, about 0.15 cubic yards of bedrock would be excavated as a minimal foundation cleanup for the barrier and deposited on the upstream side of the proposed

barrier within the stream channel, where sediment from upstream would accumulate once construction was complete.

3.2.2.3 - Construction Access

Overland access to the site is limited. An existing, unmaintained USFS road (FR1530) provides 4x4 high-clearance vehicle and off-highway vehicle (OHVs) access from the Horseshoe Dam road (FR 205, a maintained road) to the Lime Creek floodplain approximately 1.75 mi downstream of the barrier site. From the end of the FR1530 road, the construction crew would hike to the barrier site. To minimize disturbance, construction materials and equipment would be flown to the barrier site using a helicopter.

3.2.2.3.1 – Aircraft access

A helicopter would be used to transport equipment, supplies, and concrete for construction purposes. All equipment and supplies would be "long-lined" from the SRP field house to the construction site (Figure 1); the helicopter would not land at the barrier construction site. The supplies and equipment would be placed in a designated staging area at the barrier site (see contractor use area).

The helicopter would be used at least three times during construction: 1) at the onset of the project to transport supplies, materials, and equipment to the site; 2) during construction to transport concrete (approximate eight trips); and 3) at the end of the project to transport material out of the site. Dust abatement would be provided at the field house.

In addition, an emergency landing spot would be designated near the construction site for evacuation of injured personnel. The emergency extraction site would be located downstream of the construction site on a hilltop that allows safe helicopter landing. Only in the case of emergency, vegetation (1 ocotillo, 3 - 4 palo verde, 1 hopbush, and 1 jojoba) would be trimmed with hand tools to allow safe landing and takeoff.

3.2.2.3.2 - Vehicle access

An existing two track road (FR1530) begins at the Horseshoe Dam road and ends approximately 1.75 mi downstream from the proposed barrier site. This road is approximately 2 miles long and is currently designated as open for all vehicles (USFS 2009). FR1530 would serve as worker access using high clearance vehicles or OHVs and require little to no repairs. If necessary, minor repairs would be made to the road (e.g., filling in washouts or large ruts) but any such actions would be limited to the existing road prism and the use of hand tools. Along FR1530, endangered Arizona cliff rose (*Purshia subintegra*) would be flagged to protect this plant species from damage.

3.2.2.3.3 - Pedestrian access

Construction personnel would access the site by hiking from the end of FR1530 where the road terminates at Lime Creek. Recreation trails are absent in this area; thus, the crew would hike up the creek to the barrier construction site.

3.2.2.4 - Contractor Use Area

3.2.2.4.1 - Construction staging area

A staging area would be delineated at the construction site for the storage of supplies and materials. The staging area (20 x 30 ft) would be located approximately 50 ft downstream of the barrier site on a terrace above the flood prone area of the creek. The area has sandy substrates and is surrounded by bedrock. No vegetation clearing or grading in this area would be required.

Other construction materials, such as those needed early in construction could be placed by long-line at the barrier site on the bedrock. Although the majority of concrete will be flown into the site premixed and poured into forms, any bags of concrete stored at the staging area will be protected from precipitation to prevent hardening prior to placement. Precision placement by helicopter sling line eliminates the need for clearing near terraces. All construction materials and debris not part of the completed barrier would be removed from the jobsite.

3.2.2.4.2 - Camping area

The contractor may chose to camp along the FR1530 road to reduce the daily travel time to the construction site. The crew camp would be placed along the FS1530 road in a previously disturbed area that has been used by recreational campers (Figure 1). The camping area would be delineated with flagging to avoid impacts to cultural resources. The contractor would coordinate other camping requirements and restrictions (e.g., fire restrictions) with the Cave Creek Ranger District. At the completion of the project, the area would be reseeded with native grass seed mix.

3.2.2.5 - Construction Methods and Materials

Construction would be accomplished with small portable tools powered by an onsite air compressor or generator. A small coffer dam may be constructed upstream of the barrier site using sandbags or other similar materials, and stream flow may be temporarily piped downstream of the barrier to maintain a dry construction area. The construction crew would employ typical methods for building a concrete structure (USBR 2009). Concrete would be batched at or delivered to the SRP field house, and flown by helicopter to the construction site once the forms have been set. Remaining materials and equipment would be removed from the site once construction is completed.

Approximately 5,000 gallons of water would be used to complete the project. Water (2,500 gallons) would be used at the barrier site for construction (e.g., cleaning the foundation and mixing grout). The water supply would be taken from the creek (if surface flow is available) or flown to the site with other materials. An additional 2,500

gallons would be used for dust control at the SRP field house during helicopter use. A water truck would draw the water from the Verde River or Horseshoe Reservoir.

3.2.2.6 - Construction Timing

The barrier would be constructed between September and November and take approximately 30 to 45 days to complete. The timing of construction, during late fall after monsoon rains, minimizes the risk of flooding and avoids the migratory bird breeding period (spring-summer).

3.2.2.7 – Aquatic Species Conservation Measures

In September 2009, the barrier site was dry, thus no impacts to aquatic species would be expected to occur. However, surface water has been present in the past and could be present during construction; therefore, conservation measures are described and would be implemented if fish or other aquatic organisms were present during construction. Block nets would be placed approximately 150 ft upstream and downstream of the project site to isolate the project site and prevent fish from moving into the construction area. The area inside the block nets would be thoroughly sampled using various gear types (electroshocking unit, dipnets, and seines) prior to construction. Captured native fish and frogs would be moved upstream of the project site above the block net. If heavy precipitation occurs during the construction period, which compromises the block net, construction would cease until the area can be re-sampled, fishes moved, and block nets repositioned.

3.2.2.8 - Fish Barrier Monitoring and Maintenance

The SUP would authorize SRP to monitor and maintain the barrier for the term of the ITP Regular monitoring of the barrier's integrity and condition would occur no less than 1 time in any 5-year period by SRP. Access to the site would be the same as for the construction crews (i.e., OHV on the FS1530 road and hike to the barrier site). Road repairs to improve access would be minimized and restricted as described above. Additional monitoring of the barrier by SRP would occur if there were extremely high stream flows in the creek, and/or if SRP received information from USFS or another agency of structural problems with the barrier.

SRP would maintain the condition of the barrier. Maintenance includes activities that are necessary to maintain the effectiveness of the barrier, but do not increase the footprint of the barrier or cause temporary impacts greater than those described for construction. If repairs are necessary, the same mitigation and avoidance measures as described above and in Section 3.3 would be implemented (e.g., material flown to the site, sensitive aquatic and plant species protected, and culture sites avoided). Maintenance actions may include, but are not limited to patching and repairing cement, and/or re-anchoring the barrier. Any maintenance activities of the barrier by SRP must first be approved by the Forest Service and will be identified in the SUP.

3.3 - Mitigation Measures_

To avoid or minimize potential impacts of the proposed action on the environment, the following measures were incorporated into the proposed action:

- To reduce the visual impact of the barrier, it would be constructed of colored concrete to match the existing rock surface.
- To minimize surface disturbance, helicopter operations would be employed to "long-line" equipment to the construction site. The helicopter would not land on site and the equipment would be placed in a designated laydown area or on exposed bedrock terraces.
- To minimize impact to the site and avian species, construction activities would occur between September and November, during the low flow period and outside of the spring/summer migratory bird nesting season.
- To minimize disturbance to the environment, vehicles would be limited to existing road surfaces. Although not anticipated, if repairs to the FR1530 are necessary, actions would be conducted with hand tools and would be limited to the existing roadway. No heavy equipment would be used.
- The contractor may elect to camp within a designated location along FR1530. The
 area would be delineated to protect cultural resources. The contractor would
 coordinate other requirements and restrictions (e.g., fire restrictions) prior to
 camping. The camping area would be seeded with a weed-free native grass seed
 mix.
- All equipment that may be carrying seeds or appears muddy/dirty would be washed prior to its transportation to the construction site. Any erosion control measures (hay bales, etc.) would be weed-free.
- The immediate area on both sides of FR1530 would be surveyed for Arizona cliffrose prior to construction activities. Any cliffrose that are located would be flagged and construction crews given instructions to avoid harming the plants.
- Prior to construction activities, fish netting would be placed above and below the barrier site. All native fish and frogs would then be captured and moved upstream of the construction site. If there is a breach of the nets during construction, activities would cease until the nets were reestablished, the barrier site was sampled for fish and frogs, and individuals were relocated upstream.
- Lubricants and fuel would be stored only in areas not subject to inundation during high flows. These materials would be stored in temporary, clearly marked, above-ground containers that would provide for secondary containment. Any spills would be corrected immediately in accordance with state and federal regulations.
- Construction personnel will coordinate with the Cave Creek Ranger District regarding fire precautions and shall observe all posted fire restrictions and closures.
- Steps would be taken to prevent contact between stream flow and barrier concrete until the concrete cures and curing agents have evaporated.
- At the completion of construction, all unused materials, supplies, and construction debris would be removed from the site.

3.4 - Comparison of Alternatives

This section provides a summary of the effects of implementing each alternative. Information in the table is focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives.

Table 1. Comparison of impacts between alternative.

Resource	No Action Alternative	Proposed Alternative
Land Use and Recreational Impacts	No impact	The barrier would be easily crossable by hikers and hunters, and would be a minor obstacle to equestrian use. No impact to the Lime Creek Inventoried Roadless Area.
Geology and Soils	No impact	The current erosion and deposition characteristics are anticipated to continue unchanged downstream of the barrier once precipitation increases stream flow and deposition of material upstream of the barrier occurs. Based upon historic precipitation patterns in the area, deposition of a minor amount of sediment upstream of the barrier would occur during winter rains shortly after barrier completion. The area upstream of the barrier affected by sediment deposition would be 0.08 acre.
Vegetation	No impact	Temporary loss of minor amounts of herbaceous vegetation as a result of construction activities. There may be a minor increase in riparian vegetation where sediment would collect above the barrier (0.08 acres) and be available for colonization by riparian plants.
Terrestrial Species	No impact	There may be short-term disruption of activities as a result of construction. The barrier would cause minor impacts to small terrestrial species by impeding movement in the stream channel, Terrestrial species would be able to move upstream or downstream of the barrier by moving on land, up slope from the barrier location.

Resource	No Action Alternative	Proposed Alternative
T & E, Forest Sensitive Species	Continuing potential for nonative fish to move up stream and threaten the Gila topminnow, longfin dace, and lowland leopard frog. No impact to sensitive terrestrial species or Arizona cliffrose.	Long-term beneficial effect to the Gila topminnow, longfin dace, and lowland leopard frog upstream of the barrier site. The anticipated loss of stream baseflow in Lime Creek below the barrier due to increased evaporation would be less than 0.001 cubic/feet/second (cfs) resulting in a negligible loss of aquatic habitat downstream of the barrier. The loss is expected to be negligible and insignificant because the aquatic habitat is currently not suitable (or expected to become suitable over time) for threatened, endangered or sensitive aquatic species because it has intermittent flow and contains nonnative predatory species. No anticipated short-term impact from construction activities on sensitive aquatic species; avoidance measures would be implemented. Potential impacts to Arizona cliffrose would be avoided.
Water Resources	No impact	Permanent reduction in flow past the barrier site of 0.23 acre-feet/year (stream baseflow reduction of less than 0.001 cfs). One-time use of 0.2 acre-feet for construction related purposes. Impacts to downstream water rights holders would be mitigated though one-time purchase or exchange of water.
Cultural Resources	No impact	No cultural resources would be impacted by barrier construction. Cultural resources were identified at the potential camping area and would be avoided.
Visual Resources	No impact	The proposed barrier would result in minor, though permanent, site-specific visual impacts within the creek channel immediately adjacent to the barrier. The barrier site is not visible from public use areas such as roads, trails, and recreation sites and will be colored to match surrounding bedrock.

4.0 - ENVIRONMENTAL CONSEQUENCES

This section summarizes the physical, biological, social and economic environments of the affected project area and the potential changes to those environments due to implementation of the alternatives. It also presents the scientific and analytical basis for comparison of alternatives presented in the chart above. The following elements have been analyzed and would not be affected: Air Quality, Wastes (hazardous or solid), Noxious Weeds, and Environmental Justice.

4.1 – Land Use and Recreational Impacts _____

4.1.1 – Affected Environment

The proposed barrier site is located in the Lime Creek Inventoried Roadless Area with no direct access to public roads, trails, or recreation sites. Travel in the canyon above the end of FR1530 is primarily on foot or horseback. Recreational use of Lime Creek in the project area is light and dispersed. Recreation consists primarily of hiking, hunting, horseback riding, and bird watching.

4.1.2 - Environmental Consequences

4.1.2.1 - No Action Alternative

There would be no change in existing conditions. Current land use and resource management would continue, as would federal protections to threatened and endangered species and other resource values.

4.1.2.1 - Preferred Alternative

Construction of the barrier may create a minor impediment to equestrian use; however, horseback riding in Lime Creek is rare. An existing non-system horse trail exists above the north side of Lime Creek, and would not be impacted once the barrier is completed. Horseback riders that choose to travel up the stream channel instead of on the unauthorized trail would be able to exit the confined drainage where the barrier would be constructed, and reenter upstream or downstream of the barrier; thus, the impact would be minor. Most hikers and hunters could easily cross the barrier on foot. The proposed project would have a negligible effect on other forms of recreation. No increase in recreation is anticipated in the project area because access would not be significantly improved - no new roads would be created and only minor repair with hand tools to FR1530 would occur if required. FR 1530 is a Level II road and would be left in the same condition that existed prior to barrier construction

4.2 - Geology and Soils _____

4.2.1 – Affected Environment

The bedrock channel at the proposed fish barrier site is 5 ft wide near the existing water surface and widens to about 22 feet wide at 4 ft above ground. The foundation and abutments of the Lime Creek fish barrier consists of granite porphyry. Alluvium material is present in pools upstream and downstream of the site and is comprised of coarse sand, subangular gravel and cobbles. Cobbles range in size up to about six inches. Few boulders are present in the stretch immediately upstream and downstream of the site. However, numerous boulders up to one cubic yard in volume are present upstream and downstream of the narrow section where the site is located.

Flow at the site typically deposits the alluvial sediments in pools downstream of naturally occurring falls or chutes in the bedrock currently located upstream of the barrier site. These sediments tend to form deep pools just downstream of the falls (where velocity is high), and gravel builds up towards the outlet of the pools.

4.2.2 – Environmental Consequences

4.2.2.1 - No Action Alternative

The no action alternative would leave the current geology and soil conditions as they currently exist. The bedrock would remain exposed to the same extent that it currently is.

4.2.2.2 – Preferred Alternative

The current erosion and deposition characteristics described above (Section 4.2.1) are anticipated to continue unchanged downstream of the barrier (USBR 2009). However, upstream of the barrier the volume of sediment trapped would increase, as would the size of the pool of water formed behind the barrier. The volume of sediment, which extends approximately 200 ft upstream (0.08 acres), is estimated to be 240 cubic yards. Over time, the volume of water pooled upstream of the barrier would decrease as sediment is deposited, displacing the water (USBR 2009).

No channel migration is anticipated to occur due to fish barrier construction over the life of the structure because the stream channel is constrained by bedrock.

4.3 – Biological Resources

4.3.1 - Vegetation

4.3.1.1 – Affected Environment

Upland vegetation in the project area is characteristic of the Sonoran Desert Scrub community as described by Brown (1994). The area is dominated by saguaro (*Carnegiea gigantean*), prickly pear cactus (*Opuntia sp.*), mesquite (*Prosopis sp.*), palo verde (*Cercidium sp.*), cholla (*Opuntia sp.*), ocotillo (*Fouquieria splendens*), brittle bush (*Encelia farinose*), and hop bush (*Dodonaea viscose*).

There is little riparian vegetation at the proposed barrier site because most of the area is predominately bare rock with little soil. Above and below the barrier site there is very sparse woody riparian vegetation characteristic of Sonoran riparian deciduous forest as described by Brown (1994). This area is primarily barren rock and sand interspersed with individual cottonwood (*Populus fremontii*), Goodding's willow (*Salix gooddingii*), and tamarisk (*Tamarisk chinensis*).

4.3.1.2 - Environmental Consequences

4.3.1.2.1 - No Action Alternative

The no action alternative would maintain the current vegetation conditions.

4.3.1.2.2 - Preferred Alternative

There may be short term minor impact to herbaceous vegetation at the barrier site as a result of construction activities. There would likely be short term minor impacts to herbaceous vegetation in the creek bottom, due to trampling from construction crew hiking to the barrier site. There is the potential for a small amount of riparian vegetation

to colonize the area immediately above the barrier where sediments would deposit. There are no anticipated impacts to woody riparian plant species.

4.3.2 – Terrestrial Wildlife

4.3.2.1 – Affected Environment

Wildlife in the study area is characteristic of the Sonoran Desert Scrub community as described by Brown (1994). A diversity of mammals is present in the desert scrub vegetation surrounding the reservoirs and riparian habitat on the Verde River and its tributaries. Big game species such as mule deer (*Odocoileus hemionus*) and javelina (*Tayassu tajacu*) are occasionally present. Predators in the area include coyote (*Canis latrans*), bobcat (*Lynx rufus*), gray fox (*Urocyon cinereoargenteus*) and mountain lion (*Felis concolor*). Furbearing species such as raccoon (*Procyon lotor*) occur in riparian areas.

Numerous birds are found in upland and riparian water habitats including, Gilded flicker (*Colaptes chrysoides*), curve-billed Thrasher (*Toxostoma curvirostre*), Gambel's quail, (*Callipepla gambelii*), cactus wren (*Campylorhynchus brunneicapillus*), turkey vulture (*Cathartes aura*), and red-tailed hawk (*Buteo jamaicensis*). Reptiles that occur in the area include Gila monster (*Heloderma suspectum*), western diamond-backed rattlesnake (*Crotalus atrox*), and eastern fence lizard (*Sceloporus undulates*).

4.3.2.2 – Environmental Consequences

4.3.2.2.1 – No Action Alternative

The no action alternative would maintain the current terrestrial habitat conditions and not impact terrestrial wildlife.

4.3.2.2.2 – Preferred Alternative

The effects of construction on terrestrial wildlife would be minimal and temporary. Because no heavy equipment would be used, there would be a small to nonexistent threat of injury to small animals such as rodents and reptiles from the construction activities. There would also be temporary noise-related disturbances to wildlife from construction and the potential campsite use. Habitat disturbances would be very minor compared with the total amount of similar terrestrial habitat available on the Tonto National Forest, and would result in no permanent loss of terrestrial habitat. Because all construction activities would occur outside the avian breeding season there would be no effect on nesting birds.

Following construction, there would be a permanent replacement of terrestrial habitat (0.04 acre) with aquatic habitat. While the terrestrial habitat would decrease, it is likely that once sedimentation occurs upstream of the barrier there would be a minor increase in riparian vegetation along the current bedrock exposed site. This potential increase in vegetation may provide additional habitat for avian and terrestrial riparian species

The barrier would create a minor impediment to upstream and/or downstream movement for a limited number of reptiles (primarily snakes and Gila monsters) and small mammals. These impacts would be localized, as the home ranges of species potentially affected are small, and most species are capable of overland travel along the slopes of the canyon and adjoining uplands. The barrier would have a negligible impact on large mammals. Deer, collared peccary, raccoons, and all mammals could travel around the barrier.

4.3.3 – Federally Protected, Forest Sensitive, and State Listed Sensitive Species

4.3.3.1 - Affected Environment

Table 2. Federally threatened, endangered, or candidate species that are present or may potentially be present in the project area.

potentially be present in the pre	Jeet area.	
Common Name	Scientific Name	Status ¹
Bald eagle (desert nesting)	Haliaeetus leucocephalus	FT, S, WSCA
Gila topminnow	Poeciliopsis occidentalis	FE, WSCA
Longfin dace	Agosia chryogaster	S
Lowland leopard frog	Rana yavapaiensis	S, WSCA
Gila monster	Heloderma speculatum	S
Arizona cliffrose	Purshia subintegra	FE, NPL(HS)

FE = Federally listed as Endangered Species; FT = Federally listed as a Threatened Species; S = USFS Sensitive Lists; NPL(HS) = Arizona Protected Native Plant List, Highly Safeguarded; WSCA = AGFD Wildlife of Special Concern in Arizona.

Table 3 lists federally threatened, endangered, or candidate species, Forest Service Sensitive species, and state listed species of Special Concern that would not be affected by the project because: the project area lacks suitable habitat; the species is migratory and would not be present during the construction period; and/or the current range for the species is outside of the project area.

Table 3. Federally protected and state sensitive species that would not be affected by the proposed project.

Common Name	Scientific Name	Status ¹
Arizona bell's vireo	Vireo bellii arizonae	S, MIS
Common black-hawk	Buteolgallus anthracinus	S
Cactus ferruginous pygmy- owl	Glaucidium brasilianum cactorum	S, WSCA
Southwestern willow flycatcher	Empidonax traillii extimus	FE, CH, WSCA

Table 3. Federally protected and state sensitive species that would not be affected by the proposed project.

Common Name	Scientific Name	Status ¹
Yellow-billed cuckoo	Coccyzus americanus	Candidate, S, WSCA
Yuma clapper rail	Rallus longirostris yumanensis	FE, WSCA
Colorado pikeminnow	Ptychocheilus lucius	FE, WSCA
Headwater chub	Gila nigra	FC, S
Razorback sucker	Xyrauchen texanus	FE, CH, WSCA
Loach minnow	Tiaroga cobitis	FT, WSCA
Roundtail chub	Gila robusta	FC, S, WSCA
Spikedace	Meda fulgida	FT, WSCA
Sonoran desert tortoise	Gopherus agassizii (Sonoran population)	Petitioned to be listed on 10.9.08, S, WSCA
Narrow-headed gartersnake	Thamnophis rufipunctatus	S, WSCA
Northern Mexican gartersnake	Thamnophis eques megalops	FC, S, WSCA
Hohokam agave	Agave murpheyi	S, NPL(HS)
Horseshoe deer vetch	Lotus mearnsii var. equisolensis	S
Hualapai milkwort	Polygala rusbyi	S
Ripley wild buckwheat	Eriogonum ripleyi	S, NPL(SR)
Toumey agave	Agave toumeyana var bella	NPL(SR)

¹FE = Federally listed as Endangered Species; FT = Federally listed as a Threatened Species; S = USFS SW Region Sensitive Lists; MIS = Management indicator species; NPL(HS) = Arizona Protected Native Plant List, Highly Safeguarded; NPL(SR) = Arizona Protected Native Plant List, Salvage Restricted; WSCA = AGFD Wildlife of Special Concern in Arizona.

4.3.3.1.1 - Bald eagle

The bald eagle is a large bird of prey usually found along lakes, rivers, and reservoirs in Arizona. Bald eagle prey is mainly large bodied fish (e.g., carp, native suckers), but also includes waterfowl, small mammals, and carrion. Fish abundance and species diversity are important for successful bald eagle breeding in Arizona. Arizona bald eagles lay eggs between December and March and usually nest on cliffs and rock pinnacles, or in cottonwood trees. Young fledge in late spring and early summer (AGFD 2002a).

The bald eagle historically ranged and nested throughout North America except extreme northern Alaska and Canada, and central and southern Mexico. The bald eagle south of the 40th parallel was listed on March 11, 1967 as endangered under the Endangered Species Preservation Act of 1966 (USFWS 1967), and was reclassified to threatened status on July 12, 1995 (60 FR 36000). No critical habitat has been designated for the

species. The bald eagle was proposed for delisting on July 6, 1999 (64 FR 36454), and was delisted on July 9, 2007 (72 FR 37346). However, on March 5, 2008, the U.S. District Court for the District of Arizona enjoined the USFWS from delisting the Sonoran Desert bald eagle population pending the outcome of USFWS review of whether continued listing of the distinct population (DPS) segment is warranted (73 FR 23966). On February 26, 2010, the USFWS concluded that the Sonoran Desert bald eagle population does not meet the definition of a DPS, and therefore is not a listable entity under the ESA (75 FR 8601). The USFWS intends to publish a notice to remove this population from the List of Threatened and Endangered Wildlife (*Id.*). AGFD (2006) lists the bald eagle as Wildlife of Special Concern and the Forest Service lists the bald eagle as a Sensitive Species (AGFD 2002a).

Historically, the bald eagle experienced rangewide reductions in distribution and abundance largely due to significant declines in reproductive rates caused by the use of the pesticide DDT. Current threats to the species are habitat loss, human encroachment into breeding habitat, entanglement in fishing line, reduction or significant changes in fish populations, illegal shooting, and heavy metals.

Bald eagles are not known to nest or forage in Lime Creek. Three bald eagle pairs nest and/or forage near or just downstream of Horseshoe Reservoir (i.e., Table Mountain, Horseshoe, and Cliff breeding areas) (McCarty and Jacobson 2008). The three nest sites occur greater than 1 mile from the project area. However, the eagles that use these nesting sites may forage in the lower portion of Horseshoe Reservoir that is adjacent to the helicopter flight path that would be used during transport of material from SRP's field house to the construction site. Wintering (migratory) bald eagles also use Horseshoe Reservoir as a foraging area.

4.3.3.1.2 - Gila topminnow

The Gila topminnow is a 1- to 2-inch fish that inhabits headwater springs, small streams, and cienegas. This species prefers warm water in a moderate current with dense aquatic vegetation and algae mats, where it feeds on aquatic insects, mosquito larvae, crustaceans, and detritus. Gila topminnow breeds primarily from March to August.

The Gila topminnow was listed as endangered by USFWS in 1967. Critical habitat has not been designated for this species. This species is also listed as a Sensitive Species by the Forest Service and as Wildlife of Special Concern by AGFD. Threats to the Gila topminnow include habitat loss, predation and competition by nonnative fishes, pumping, drought, and development of springs.

The Gila topminnow was historically considered the most abundant fish in the Gila River basin, particularly in low to mid-elevation streams, but is now limited to relatively few sites in southern Arizona. Lime Cabin Springs, at the headwaters of Lime Creek was initially stocked with topminnow in 1982. In 1983, the species was thought to be extirpated from the location. In 1996, and periodically thereafter, topminnow have been detected downstream of the springs in the creek (Weedman 1998, Voeltz and Bettasso 2003). During surveys of Lime Creek in 2007 and 2008, Gila topminnow was detected in

limited numbers starting at approximately 1.5 miles above the project area, but not at the proposed barrier site. In September 2009, Lime Creek was dry ¼ mile upstream of the barrier site and was dry for most of the reach downstream of the barrier to Horseshoe Reservoir, except for one small pool located ¾ mile downstream of the barrier site. No Gila topminnow was detected in this pool during field sampling (SRP 2010).

4.3.3.1.3 - Longfin Dace

The longfin dace is a 2- to 3-inch fish found in cool upland streams to low desert streams. Spawning occurs between December and July with a surge in spawning activity in April.

The longfin dace is listed as a Tonto National Forest sensitive species. Threats include human activities that alter the quality or flow of water, including flood attenuation and irrigation, as well as predation from and competition with nonnative fishes.

Longfin dace occur in Lime Creek. Their abundance and distribution within the creek vary over time, likely in response to precipitation and the availability of habitat. At times the population has been rare and located at or above the potential barrier site (Voeltz 2003). On other visits, the population was highly abundant and extended below the proposed barrier site (Paradzick and Voeltz 2006). In 2009, longfin dace were present in a small isolated pool downstream of the proposed barrier site (SRP 2010).

4.3.3.1.4 - Lowland Leopard Frog

The lowland leopard frog generally occurs below 6,400 ft elevation in aquatic systems in desert grasslands to pine-oak woodlands, typically in association with permanent waters. The lowland leopard frog appears to prefer streams rather than ponds or other aquatic habitats, but can be found in beaver ponds, cienegas, and stock tanks. The species primarily reproduces from January to May, and sometimes in summer and early fall during the summer monsoon season. Females deposit egg masses in shallow water, which attach to submerged vegetation, bedrock, or gravel. Adult lowland leopard frogs feed on arthropods and other invertebrates. Larval lowland leopard frogs are herbivorous and likely eat algae, organic debris, and plant tissue (AGFD 2001).

The lowland leopard frog is listed as Wildlife of Special Concern (AGFD 1996). The species has disappeared from most of the lower Gila and lower Colorado River systems; however, the remaining populations in central Arizona are thought to be stable (AGFD 2001). Nonnative predaceous fishes, Rio Grande leopard frogs and bullfrogs, human uses of their habitat, and chytrid fungus are among the major threats to lowland leopard frog populations (AGFD 2001).

Lowland leopard frogs were documented in the project area during field visits when surface water was present (Voeltz 2003; Paradzick and Voeltz 2006). In 2009, no leopard frogs were observed near the barrier site or in the one pool downstream of the barrier (SRP 2010).

4.3.5.1.5 – Gila monster

The Gila monster is a large (up to 22 inches), thick bodied venomous beaded lizard with a large head and a rounded tail (AGFD 2002b). There are two subspecies of the Gila monster, the banded Gila monster (*Heloderma suspectum cinctum*), and the reticulate Gila monster (*Heloderma suspectum suspectum*). Gila monsters are primarily diurnal and spend much time underground (AGFD 2002b). Mating takes place in early summer with eggs being deposited underground in the sand of washes to hatch the following May (AGFD 2002b).

The reticulate Gila monster is a Tonto National Forest Sensitive Species and is listed on the Forest Service Southwestern Region Sensitive Animal List. Threats include, road kills, urban expansion, pet trade collection, and destruction of denning sites (AGFD 2002b).

Gila monsters have been observed in Lime Creek downstream of the barrier site on two occasions (Voeltz 2005; Paradzick and Voeltz 2006).

4.3.3.1.6 - Arizona Cliffrose

Arizona cliffrose is an evergreen shrub of the rose family. Its height can reach up to 8 feet. The bark of the cliffrose is light gray and shreddy. New growth is generally redbrown in color and often covered with soft white hares. The leaves are variable in shape, but are generally very narrow and short. Leaves average 0.1 inch wide by 0.3 inch long. The leaves are usually lobe-less, with the margins curved toward the underside of the lid. Flowers are composed of 5 yellow or white petals which are about 0.4 inch long.

Arizona cliffrose was listed as endangered by the USFWS in 1984. Critical habitat has not been designated for this species. This species is also protected by the Arizona Native Plant Law (A.R.S. §§ 3-901 though 3-934). Threats to the Arizona cliffrose vary with location, but include habitat disturbance and destruction caused by urbanization, mining, road construction, pesticide application, off-road vehicle traffic, and browsing by burros and cattle.

Arizona cliffrose is known to exist as four isolated populations in Arizona. One of the populations occurs on tertiary limestone lakebed deposits near Horseshoe Reservoir, including areas directly adjacent to FR1530.

4.3.3.2 – Environmental Consequences

4.3.4.2.1 - No Action Alternative

The potential for upstream movement of nonnative fishes from the Verde River would continue to threaten the populations of longfin dace, Gila topminnow, and lowland leopard frog in Lime Creek. There would be no impacts to listed / sensitive terrestrial species, specifically, the bald eagle, Gila monster, and Arizona cliff rose.

4.3.4.2.2 - Preferred Alternative

4.3.4.2.2.1 - Bald eagle

The proposed construction period and maintenance (i.e., repair) activities would occur outside of the bald eagle breeding season. Thus, there would be no impacts to nesting eagles. Helicopter use is not expected to cause impacts to wintering and/or resident desert nesting bald eagles that use the lower portion of Horseshoe Reservoir or the Verde River for foraging because its use would be of short duration (few hours over several days) and the flight path would be over land and >1/4 mile from the potential foraging areas.

4.3.4.2.2.2 - Gila topminnow

The proposed action would have a long-term beneficial effect on the Gila topminnow by preventing predation and competition impacts from nonnative fish species.

There would be no direct negative impacts to the Gila topminnow during construction because of the distance (1.5 mi) between the location of potentially occupied stream habitat and the project site (USBR 2009). Should topminnow move downstream prior to construction (or if maintenance was performed) negative impacts would be avoided by the pre-project survey, relocation of individuals, and upstream netting that would prevent topminnow from entering the project site (USBR 2009). The indirect impacts of construction could include the impediment to upstream movement by topminnow from lower reaches of Lime Creek. However, no long-term negative impacts are anticipated because the reach of stream downstream of the barrier is intermittent and over time, when surface water is present, would be occupied by predatory nonnative fish, which would prevent viable populations of topminnow from establishing and persisting.

4.3.4.2.2.3 - Longfin dace

The proposed action would have a long-term beneficial effect on longfin dace by preventing predation and competition impacts from nonnative aquatic species.

There would be no direct or indirect negative effects to the longfin dace because the construction site would be surveyed and the fish relocated upstream (for both initial construction and maintenance activities). Netting would be placed to prevent the fish from entering the project site (USBR 2009). The indirect impacts of construction include the impediment to upstream movement by longfin dace from lower reaches of Lime Creek. However, no long-term negative impacts are anticipated because the reach of stream downstream of the barrier is intermittent and over time, when surface water is present, would be occupied by predatory nonnative fish, which would prevent viable populations of longfin dace from establishing and persisting.

4.3.4.2.2.4 - Lowland leopard frog

The effects to lowland leopard frogs would be similar to that of the longfin dace and topminnow. The proposed project would provide long-term benefits to the leopard frog

population in Lime Creek by preventing upstream movement of nonnative aquatic species that compete or prey upon frogs.

Pre-construction surveys, relocation of frogs to upstream areas, and block netting would avoid impacts to the frog caused by construction and maintenance actions. Individual frogs could move around the block netting and be harmed during construction; however, this is unlikely due to their low abundance.

The indirect impacts of construction include the impediment to upstream movement by lowland leopard frog from lower reaches of Lime Creek. However, the impact is considered negligible because of the frog's ability to move up over or around the barrier. Also, the reach of stream downstream of the barrier is intermittent and, when surface water is present, would be occupied by predatory nonnative fish, which would reduce or preclude the establishment and persistence of frogs.

4.3.4.2.2.5 - Gila monster

The impacts to Gila monster are anticipated to be zero or negligible because individuals would be avoided or relocated outside the project area during construction activities. Because the construction site has intermittent flow and bedrock substrates, it is not expected that the reach would be used for denning or nesting; thus, no impacts to adults or eggs would occur.

There are no anticipated indirect impacts to Gila monsters, because Gila monsters could move over or around the barrier.

4.3.4.2.2.6 - Arizona cliffrose

The use of FR1530 for access to Lime Creek could cause negative impacts to Arizona cliffrose if a vehicle left the existing roadway and damaged an individual plant(s). To avoid the potential for impacts, the immediate area on both sides of the FS1530 road would be surveyed for cliffrose prior to construction (and future maintenance). All cliffrose that are located would be flagged and construction crews would be directed to not drive off of the existing roadway and to avoid the marked plants.

4.4 – Water Resources

4.4.1 – Affected Environment

Lime Creek drains approximately 45 mi² west of the Verde River including portions of Willow Spring Mountain, Humboldt Mountain, Rover Peak, East and West Cedar Mountain, and all of Lockwood Mesa. The watershed includes several springs. These springs include Indian, Cottonwood, Ash, Lime Creek and two unnamed springs. Several named drainages feed into Lime Creek above the proposed fish barrier site. These include Ash Spring Creek, Little Cougar Canyon, Cougar Canyon, Long Canyon, Little Lime Creek, and Professor Creek. Annual precipitation in the study area is 15 inches (USBR 2009).

There are numerous drainages and springs feeding Lime Creek, however, the lower reach of the stream is intermittent below the proposed fish barrier site. The stream becomes perennial with distance upstream of the barrier site. There is no flow gage on Lime Creek and stream flow has not been measured. However, USBR (2009), using a flood frequency software program, estimated that peak flood flows at the barrier site ranged between 418 cfs (2-yr return interval) and 14,900 cfs (100-yr return interval).

4.4.2 – Environmental Consequences

4.4.2.1 – No Action Alternative

The no action alternative would maintain the existing hydrological conditions in Lime Creek. There would be no water use associated with either construction or increased evaporation (due to ponding caused by the barrier).

4.4.2.2 - Preferred Alternative

Approximately 0.02 af of water would be used during construction of the barrier; half (0.01 af) would be used from Lime Creek at the construction site (if surface water is not present during construction, water would be transported by helicopter with other materials). The remaining 0.01 af would be used for dust abatement during helicopter operations at the SRP Field House and would be withdrawn from Horseshoe Reservoir or the Verde River into a water truck (USBR 2009).

The evaporation loss caused by the additional pooled water behind the proposed barrier over the term of the permit would be approximately 11.5 af (0.23 af/yr for 50 yrs) (USBR 2009). It is estimated that the baseflow reduction caused by the evaporation losses would result in less than 0.001 cfs reduction in baseflow in Lime Creek downstream of the barrier. The estimated reduction in baseflow is not anticipated to cause adverse effects to aquatic habitat downstream of the barrier because that portion of Lime Creek is currently intermittent and occupied by nonnative predatory species (see Section 4.3.4.2.2 above).

It is anticipated that once a pool forms and sediments deposit behind barrier there will be no change in flood flows or sediment deposition rates or transport within Lime Creek (see Section 4.2.2.2). Based upon observed sedimentation following the Cave Creek Complex Fire (T. Willard pers. comm.), which is still ongoing, it is anticipated that sediments will be deposited immediately behind the barrier during the first winter or heavy precipitation event following construction.

The impact to downstream water rights holders caused by the anticipated water loss due to construction and long-term evaporation would be offset by SRP through a onetime purchase or exchange of water.

4.5 – Cultural Resources

4.5.1 - Affected Environment

The proposed action, which has the potential to impact cultural resources, is an undertaking subject to Section 106 of the National Historic Preservation Act (NHPA) of

1966, as amended. A cultural resource investigation and pedestrian survey of the project area (potential camping areas, barrier site and staging area in Lime Creek) was conducted. The access road (FS1530) was not inventoried because no areas outside the existing footprint of the road would be disturbed. The cultural report is incorporated by reference and is available as part of the administrative record (EcoPlan Associates 2009). A brief summary of the findings of the cultural investigation is provided below:

- No new cultural sites were identified
- Two previously recorded sites were relocated
- One isolated occurrence was recorded
- No cultural sites occurred or would be disturbed at the proposed barrier site or staging area.
- Impacts to cultural resources can be avoided by delineating the boundaries of the camping area.

4.5.2 - Environmental Consequences

4.5.2.1 - No Action Alternative

The no action alternative would not alter or impact existing cultural resources in the project area.

4.6.2.2 - Preferred Alternative

No cultural resources were recorded at the construction site or staging area; therefore no impacts would occur. Cultural resources recorded near the possible camp location would be avoided; construction personnel will be briefed on the cultural significance of the area, instructed to leave the area undisturbed and not to remove any artifacts. The area will be monitored during construction to ensure cultural resources are not impacted. Therefore no impacts are anticipated. No indirect impacts to cultural resources would be caused by the proposed action.

4.6 - Visual Resources

4.6.1 – Affected Environment

The diverse patterns, shapes, and dominant colors of vegetation, rock strata, and alluvial deposits of the area define the landscape character at the proposed barrier site. Scenic quality is considered above average because of the diversity and variety of visual elements. Pristine conditions generally prevail with little evidence of prior human disturbances.

4.6.2 – Environmental Consequences

4.6.2.1 – No Action Alternative

The no action alternative would not alter existing visual resources in the project area.

4.6.2.2 - Preferred Alternative

The proposed barrier would result in a minor, though permanent, site-specific modification to the landscape character. Visual impacts would be greatest within the creek channel immediately downstream of the barrier. When viewed from downstream, the basic shape of the structure would contrast with irregular and random patterns of native substrates within the canyon bottom. This contrast would be less obvious from upstream once sediment is deposited and fills behind the barrier. The walls and bends of the creek would conceal the barrier to areas which are not immediately upstream or downstream of the barrier. The barrier site is not visible from public use areas such as roads, trails, and recreation sites.

To minimize adverse visual effects, barrier concrete would be colored to blend in with surrounding rock.

4.8 - Cumulative Impacts

The Council on Environmental Quality defines cumulative impacts as the incremental impact of multiple and future actions with individually minor, but collectively significant, effects. Cumulative impacts can be concisely defined as the total effects of the multiple land uses and development, including their interrelationships, on the environment.

In the project area, cumulative impacts include motor vehicle management, dispersed recreation, past livestock grazing, and reservoir operations and management. Historically, livestock grazing may have negatively affected vegetation and federally protected and forest sensitive species. However, livestock grazing has been removed in the project area. Recreation within Lime Creek is very limited because much of the area is an Inventoried Roadless Area, which minimizes motorized travel. The Tonto Forest is currently analyzing motor vehicle use, and the analysis area includes the project area. Due to the Inventoried Roadless Area, the barrier project will have no impact on motorized use at the project site. The operations of Horseshoe Reservoir on the environment are described in the Horseshoe-Bartlett Habitat Conservation Plan (USFWS 2008). As part of that HCP, this fish barrier project was proposed to mitigate the effects on sensitive native aquatic species. There are no known activities that could cause cumulative impacts to the visual or water resources in the project area with exception of reduction in base flow of less than 0.001 cfs following barrier construction. The estimated reduction in base flow is not anticipated as having affects to aquatic habitat or species downstream of the barrier because that portion of Lime Creek is currently intermittent and occupied by predatory nonnative species.

The incremental impact of the past, present, and future activities in the project area, together with the short-term impacts of the preferred alternative, is not expected to have a significant effect on the environment. Based on the proposed project's anticipated long-term benefits and the past and current conservation actions in the project area (e.g., reduction of livestock grazing, roadless classification, Horseshoe-Bartlett HCP) the cumulative impact on sensitive aquatic species is expected to be positive.

5.0 - CONSULTATION AND COORDINATION

In preparation of this EA, we consulted and used portions of several other native fish barrier Environmental Analyses and other Environmental Impact Statements. This method of analysis allowed the preparers to provide a more accurate and robust analysis of the impacts of the proposed Lime Creek barrier. These documents are listed in the Literature Cited section.

The Forest Service consulted the following individuals, Federal, State, and local agencies, tribes and non-Forest Service persons during the development of this environmental assessment:

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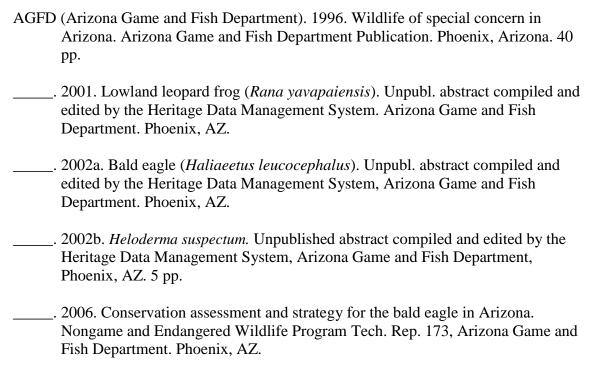
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5.4 – Others

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6.0 - LITERATURE CITED



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